**Catalogue of American Amphibians and Reptiles.**

Lawler, H.E., K.R. Beaman, and L.L. Grismer. 1995. *Sauromalus varius*.

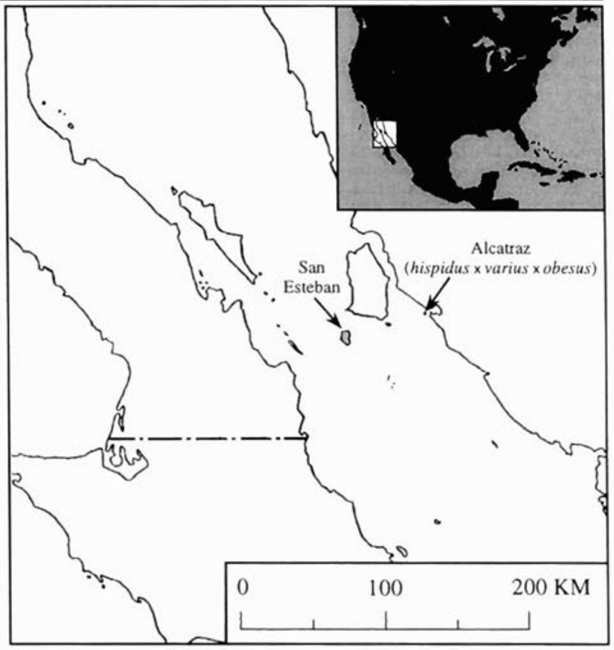
## *Sauromalus varius* Dickerson
### Piebald Chuckwalla

*Sauromalus* Townsend, 1916:428.
*Sauromalus varius* Dickerson, 1919:464. Type-locality, "San Esteban Island, Gulf of California, [Sonora] Mexico." Holotype, National Museum of Natural History (USNM) 64441, adult male, collected by C.H. Townsend on 13 April 1911 (not examined by authors). See Comment.

• **Content.** This species is monotypic.

• **Definition.** *Sauromalus varius* is a large, stout-bodied, sexually dimorphic species, with maximum head and body size of adult males and females 324 mm and 314 mm SVL, respectively (Case, 1982). Adults may reach a length of 600 mm total length (Shaw, 1945). This species is the largest member of the genus.

The head and body are much depressed, the latter being very broad. The top of the head is covered with smooth, irregular scales, which are larger in the frontal and parietal regions and become tubercular in the latter region. The superciliaries and the supraoculars are small and juxtaposed. A series of short, smooth suboculars, following the contour of the orbit, pass upward and posteriorly to the anterior border of the ear opening. The labials are minute and juxtaposed. The rostral is divided into four hexagonal scales. The symphyseal is long and narrow. A series of enlarged sublabials merge with the granular gular scales. The lateral neck fold, posterior to the ear opening, is covered by small tubercular or subconical scales. The nuchal




**Map.** Distribution of *Sauromalus varius* (see text).



**Figure 1.** Adult *Sauromalus varius* from Isla San Esteban, Gulf of California, Sonora, México.

scales are short, tubercular and subconical, weakly spinose, and grade into a median band of relatively large but weakly spinose scales extending to the rump. Lateral scalation is finer and somewhat granular with short, blunt spines. Scales on the prominent lateral fold are somewhat enlarged and bluntly spinose. The ventral scales are smaller than the median dorsal scales and weakly spinose, especially on the chest. Scale rows between the gular fold and the vent number 150-165 ($\bar{x}$ = 158.5, N = 11; Shaw, 1945). Dorsal scalation of the forelimbs is relatively coarse, weakly spinose, and faintly carinate. Scalation of the femoral region on the hind limbs is relatively fine, occasionally weakly carinate, and feebly spinose. Femoral pores number 15-18 ($\bar{x}$ = 16.1, N = 11; Shaw, 1945). The unregenerated tail length is 50-56% of the total body length. Scales on the tail are arranged in spirals and are smooth and weakly spinose, except dorsally towards the tip where they become more sharply spinose and faintly carinate. Caudal scales number 30-35 ($\bar{x}$ = 32.0, N = 11; Shaw, 1945).

The adult color pattern consists of large, irregular charcoal blotches on a yellowish to cream-brown ground color. Juveniles possess indistinct, brown transverse bands superimposed upon a light ground color with darker, irregular spots. Banding disappears with increased size.

**• Diagnosis.** *Sauromalus varius* is distinguished from all other *Sauromalus* by its large adult body size and a color pattern of large, irregular charcoal blotches on a yellowish to cream-brown ground color.

**• Descriptions.** *Sauromalus varius* was originally described by Dickerson (1919). Additional descriptions were provided by Cope (1900), Schmidt (1922), Van Denburgh (1922), and Shaw (1945). Robinson (1972, 1974) described the karyotype (2N = 36, with 12 macrochromosomes and 24 microchromosomes).

**• Illustrations.** Color photographs of an adult were published by Lawler and Jarchow (1986), Obst et al. (1988), and Gray (1995). Gray (1995) also published a color photograph of a juvenile. A color photograph in Roberts and Roberts (1976) is incorrectly labeled as *S. obesus*. Black and white photographs of adults were published by Schmidt (1922), Sylber (1985a), and Lawler and Jarchow (1986). Black and white photographs of juveniles were published by Sylber (1985a) and Lawler and Jarchow (1986). Schmidt (1922) published a black and white drawing of the dorsal and lateral views of the head and neck of an adult. Conti and Crowley (1939) showed black and white photographs of *S. varius* with tumor-like growths in the neck and leg and a photomicrograph of the isolated causal agent. A black and white photograph of a subpharyngeal abscess in *S. varius* was published by Lawler and Jarchow (1986). Robinson (1972, 1974) illustrated the karyotype.

**• Distribution.** *Sauromalus varius* is endemic to Isla San Esteban, Gulf of California, Sonora, México. Hybrids between *S. varius*, *S. hispidus*, and *S. obesus* were reported from Isla Alcatraz (Pelicano), Gulf of California, México (Robinson, 1972), where the species was reportedly introduced (Lowe and Norris, 1955). Soulé and Sloan (1966) reported a sight record from Isla Lobos (Datil). However, no specimens have ever been collected or sighted since and its occurrence there is considered unlikely.

**• Fossil Record.** None.

**• Pertinent Literature.** Taxonomic descriptions were published by Dickerson (1919), Schmidt (1922), Van Denburgh (1922), and Shaw (1945). A key to the species of *Sauromalus*, including *S. varius,* was presented in Smith and Taylor (1950). A bibliography of *Sauromalus* was published by Beaman et al. (1997). Specific topics include: natural history (Lowe and Norris, 1955; Blair, 1994); bacteriology (Conti and Crowley, 1939); parasites (Newell and Ryckman, 1964); urinary tract disease (Frye, 1983); tumor-like growths (Conti and Crowley, 1939; Bostic, 1971); lateral lymph sacs and salt secretory glands (Norris and Dawson, 1964); color adaptation and thermal relationships (Norris, 1963, 1967); energetics and diet (Pough, 1973); physiology and behavior (Bartholomew, 1963); hormonal function (Quay and Wilhoft, 1964); endangered species status (Anonymous, 1979; Dodd, 1979, 1980; Finnley, 1979a, b); colic modifications and evolution of herbivory (Iverson, 1980); evolution of body size and ecology (Case, 1978, 1982; Grismer et al., 1995); genetic characteristics of captive and natural populations (Densmore et al., 1994); captive management (Lawler, 1982, 1994; Lawler and Jarchow, 1986; Lawler et al., 1994; Gray, 1995; Mahaney, 1995); origins and evolution (Murphy, 1983a, b; Grismer, 1994a, b); feeding habits (Sylber, 1985a, 1988); social organization and mating (Ryan, 1982; Carothers, 1984); reproduction and relocation (Sylber, 1985b); phylogenetic relationships (de Queiroz, 1987a, b; Sites and Murphy, 1991); systematics and evolution (Hollingsworth, 1995). Mellink (1995) in-

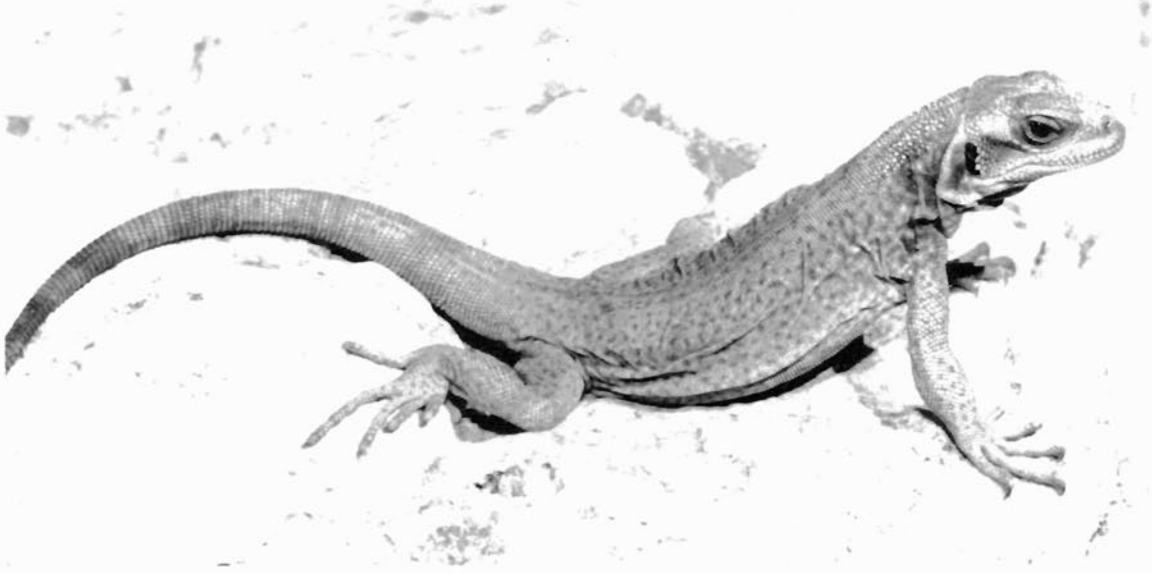


**Figure 2.** Juvenile *Sauromalus varius* from Isla San Esteban, Gulf of California, Sonora, México.

cluded *S. varius* in a discussion of commercial trade in reptiles. Various authors discussed the distribution of *S. varius* in Baja California (Lindsay, 1962; Soulé and Sloan, 1966; Loomis et al., 1974; Case, 1983; Murphy, 1983a, b; Murphy and Ottley, 1984; Grismer, 1994a, b).

• **Etymology.** The specific name *varius* comes from the Latin root *vari* which means "different" or "changing" and presumably refers to the distinct dorsal color pattern of this lizard. The word chuckwalla or chuckawalla, originally written in Spanish as "chacahuala," is derived from the Shoshone word "*tcaxxwal*" or "caxwal", the form used by the Cahuilla Indians of southeastern California (Morris, 1971). Chuckwalla is more commonly used and is preferred.

• **Comment.** The holotype was collected during an expedition jointly sponsored by the United States Bureau of Fisheries (a predecessor of the U.S. Fish and Wildlife Service) and the American Museum of Natural History. The specimen was originally catalogued into the collection of the latter (AMNH 5633) and subsequently sent to the U.S. National Museum under an agreement between the two institutions, where it was catalogued on 9 December 1921 (Townsend, 1916; Dickerson, 1919; R.P. Reynolds, in litt., 10.VIII.95).

**Literature Cited**


Anonymous. 1979. San Esteban Island Chuckwalla under review. Endang. Spec. Tech. Bull. 4(2):5.

Bartholomew, G.A. 1963. The roles of physiology and behaviour in the maintenance of homeostasis in the desert environment, p. 7-29. *In* G.M. Hughes (ed.), Homeostasis and feedback mechanisms. Symp. Proc. Exp. Biol. (18). Acad. Press, Inc., New York.

Beaman, K.R., B.D. Hollingsworth, H.E. Lawler, and C.H. Lowe. 1997. A bibliography of *Sauromalus* (Duméril 1856). Smithson. Herpetol. Info. Serv.:in press.

Blair, D.W. 1994. Chuckwallas. Reptiles: guide to keeping reptiles and amphibians 1(3):16-18, 20, 22.

Bostic, D.L. 1971. Observations on the tumor-like growths in the chuckwalla, *Sauromalus varius*. J. Herpetol. 5:76-78.

Carothers, J.H. 1984. Sexual selection and sexual dimorphism in some herbivorous lizards. Amer. Nat. 124:244-254.

Case, T.J. 1978. A general explanation of insular body size trends in terrestrial vertebrates. Ecology 59:1-18.

—. 1982. Ecology and evolution of the insular gigantic chuckawallas, *Sauromalus hispidus* and *Sauromalus varius*, p. 184-212. *In* G.M. Burghardt and A.S. Rand (eds.), Iguanas of the world: their behavior, ecology, and conservation. Noyes Publ., Park Ridge, New Jersey.

—. 1983. The reptiles: ecology, p. 159-209. *In* T.J. Case and M.L. Cody (eds.), Island biogeography in the Sea of Cortez. Univ. California Press, Berkeley.

Conti, L.F. and J.H. Crowley. 1939. A new bacterial species isolated from the chuckawalla (*Sauromalus varius*). J. Bacteriol. 37:647-653.

Cope, E.D. 1900. The crocodilians, lizards, and snakes of North America. Ann. Rept. U.S. Natl. Mus. 1898:153-1270.

Densmore, L.D., III, E.D. Pliler, and H.E. Lawler. 1994. A molecular approach for determining genetic variation in captive and natural populations of the Piebald Chuckwalla, (*Sauromalus varius*), p. 343-351. *In* J.B. Murphy, K. Adler, and J.T. Collins (eds.), Captive management and conservation of amphibians and reptiles. SSAR, Ithaca, New York.

de Queiroz, K. 1987a. A new spiny-tailed iguana from Honduras, with comments on relationships within *Ctenosaura* (Squamata: Iguania). Copeia 1987:892-902.

—. 1987b. Phylogenetic systematics of iguanine lizards: a comparative osteological study. Univ. California Publ. Zool. (118):xii + 203 p.

Dickerson, M.C. 1919. Diagnoses of twenty-three new species and a new genus of lizards from Lower California. Bull. Amer. Mus. Nat. Hist. 41:461-477.

Dodd, C.K., Jr. 1979. Review of the status of the San Esteban Island Chuckwalla. Fed. Register 44:12391.

—. 1980. Final rule on listing with endangered status for five species of foreign reptiles. Fed. Register 45:18009-18010.

Finnley, D. 1979a. San Esteban Island Chuckwalla under review. Endang. Spec. Tech. Bull. 4(3):6.

—. 1979b. Rulemaking actions. November 1979. Five foreign reptiles proposed as endangered. Endang. Spec. Tech. Bull. 4(12):8.

Frye, F.L. 1983. Urinary calculosis and cystotomy in a lizard. Vet. Med. Small Anim. Clin. 78:431-433.

Gray, R.L. 1995. San Esteban Chuckwallas *Sauromalus varius:* an Arizona-Sonora Desert Museum delight. The Vivarium 6(4):52-54.

Grismer, L.L. 1994a. The origin and evolution of the peninsular herpetofauna of Baja California, México. Herpetol. Nat. Hist. 2:51-106.

—. 1994b. Geographic origins for the reptiles on islands in the Gulf of California, Mexico. Herpetol. Nat. Hist. 2:17-40.

—, K.R. Beaman, and H.E. Lawler. 1995. *Sauromalus hispidus*. Cat. Amer. Amphib. Rept.:615.1-615.4.

Hollingsworth, B.D. 1995. Systematics of chuckwalla lizards (*Sauromalus:* Iguanidae) and the evolution of Iguanidae. M.S. Thesis, San Diego State Univ., San Diego, California.

Iverson, J.B. 1980. Colic modifications in iguanine lizards. J. Morphol. 163:79-93.

Lawler, H.E. 1982. Captive breeding and conservation: new horizons at the Desert Museum. Sonorensis 4:5.

—. 1994. Applications of field herpetology in captive management programs for endangered herpetofauna, p. 273-280. *In* P.R. Brown and J.W. Wright (eds.), Herpetology of the North American deserts: proceedings of a symposium. Southwest. Herpetol. Soc. Spec. Publ. (5). Van Nuys, California.

— and J.L. Jarchow. 1986. A captive management plan for large iguanine lizards using the Isla San Esteban Chuckwalla *Sauromalus varius* Dickerson as a model. Proc. 9th Intl. Herpetol. Symp. 9:137-164.

—, T.R. Van Devender, and J.L. Jarchow. 1994. Ecological and nutritional management of the endangered Piebald Chuckwalla (*Sauromalus varius*) in captivity, p. 333-341. *In* J.B. Murphy, K. Adler, and J.T. Collins (eds.), Captive management and conservation of amphibians and reptiles. SSAR, Ithaca, New York.

Lindsay, G.E. 1962. The Belvedere Expedition to the Gulf of California. Trans. San Diego Soc. Nat. Hist. 13:1-44.

Loomis, R.B., S.G. Bennett, S.R. Sanborn, C.H. Barbour, and H. Weiner. 1974. A handlist of the herpetofauna of Baja California, Mexico & adjacent islands. Priv. printed, California State Univ., Long Beach.

Lowe, C.H., Jr. and K.S. Norris. 1955. Analysis of the herpetofauna of Baja California, Mexico. III. New and revived reptilian subspecies of Isla de San Esteban, Gulf of California, Sonora, Mexico, with notes on other satellite islands of Isla Tiburon. Herpetologica 11:89-96.

Mahaney, P.A. 1995. A simple method of mite control. Herpetol. Rev. 26:140-141.

Mellink, E. 1995. The potential effect of commercialization of reptiles from Mexico's Baja California peninsula and its associated islands. Herpetol. Nat. Hist. 3:95-99.

Morris, W. (ed.). 1971. The American Heritage dictionary of the English language. American Heritage Publ. Co., Inc.

and Houghton Mifflin Co., New York.

Murphy, R. 1983a. Paleobiogeography and genetic differentiation of the Baja California herpetofauna. Occ. Pap. California Acad. Sci. (137):1-48.

—. 1983b. The reptiles: origins and evolution, p. 130-158. *In* T.J. Case and M.L. Cody (eds.), Island biogeography in the Sea of Cortez. Univ. California Press, Berkeley.

— and J.R. Ottley. 1984. Distribution of amphibians and reptiles on islands in the Gulf of California. Ann. Carnegie Mus. 53:207-230.

Newell, I.M. and R.E. Ryckman. 1964. *Hirstiella pyriformis* sp. n. (Acari, Pterygosomidae), a new parasite of lizards from Baja California. J. Parasitol. 50:163-171.

Norris, K.S. 1963. Preparations of radiotelemetry of the body temperatures of large reptiles, p. 283-287. *In* L.E. Slater (ed.), Bio-telemetry. Pergamon Press, London.

—. 1967. Color adaptation in desert reptiles and its thermal relationship, p. 162-229. *In* W.W. Milstead (ed.), Lizard ecology: a symposium. Univ. Missouri Press, Columbia.

— and W.R. Dawson. 1964. Observations on the water economy and electrolyte excretion of chuckwallas (Lacertilia, *Sauromalus*). Copeia 1964:638-646.

Obst, F.J., K. Richter, and U. Jacob. 1988. The completely illustrated atlas of reptiles and amphibians for the terrarium. T.F.H. Publ., Inc., Neptune City, New Jersey.

Pough, F.H. 1973. Lizard energetics and diet. Ecology 54:837-844.

Quay, W.B. and D.C. Wilhoft. 1964. Comparative and regional differences in serotonin content of reptilian brains. J. Neurochem. 11:805-811.

Roberts, M.F. and M.D. Roberts. 1976. All about iguanas. T.F.H. Publ., Inc., Neptune City, New Jersey.

Robinson, M.D. 1972. Chromosomes, protein polymorphism, and systematics of insular chuckwalla lizards (genus *Sauromalus*) in the Gulf of California, Mexico. Ph.D. Diss., Univ. Arizona, Tucson.

—. 1974. Chromosomes of the insular species of chuckwalla lizards (genus *Sauromalus*) in the Gulf of California, Mexico. Herpetologica 30:162-167.

Ryan, M.J. 1982. Variation in iguanine social organization: mating systems in chuckawallas (*Sauromalus*), p. 380-390. *In* G.M. Burghardt and A.S. Rand (eds.), Iguanas of the world: their behavior, ecology, and conservation. Noyes Publ., Park Ridge, New Jersey.

Schmidt, K.P. 1922. The amphibians and reptiles of Lower California and neighboring islands. Bull. Amer. Mus. Nat. Hist. 46:607-707.

Shaw, C.E. 1945. The chuckwallas, genus *Sauromalus*. Trans. San Diego Soc. Nat. Hist. 10:269-306.

Sites, J.W., Jr. and R.W. Murphy. 1991. Isozyme evidence for independently derived, duplicate G3PDH loci among squamate reptiles. Can. J. Zool. 69:2381-2396.

Smith, H.M. and E.H. Taylor. 1950. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. Bull. U.S. Natl. Mus. (199):v + 253 p.

Soulé, M. and A.J. Sloan. 1966. Biogeography and distribution of the reptiles and amphibians on islands in the Gulf of California, Mexico. Trans. San Diego Soc. Nat. Hist. 14: 137-156.

Sylber, C.K. 1985a. Eggs and hatchlings of the Yellow Giant Chuckwalla and the Black Giant Chuckwalla in captivity. Herpetol. Rev. 16:18-21.

—. 1985b. Feeding habits, reproduction and relocation of insular giant chuckwallas. Ph.D. Diss., Colorado State Univ., Fort Collins.

—. 1988. Feeding habits of the lizards *Sauromalus varius* and *S. hispidus* in the Gulf of California. J. Herpetol. 22:413-424.

Townsend, C.H. 1916. Voyage of the 'Albatross' to the Gulf of California in 1911. Bull. Amer. Mus. Nat. Hist. 35:399-476.

Van Denburgh, J. 1922. The reptiles of western North America. Vol. I. Lizards. Occ. Pap. California Acad. Sci. (10):1-611.

**Howard E. Lawler**, Arizona-Sonora Desert Museum, 2021 N. Kinney Rd., Tucson, AZ 85743, **Kent R. Beaman**, Section of Herpetology, Los Angeles County Museum of Natural History, 900 Exposition Blvd., Los Angeles, CA 90007 and Tierra Madre Consultants, Inc., 1159 Iowa Ave., Riverside, CA 92507, and **L. Lee Grismer**, Department of Biology, La Sierra University, Riverside, CA 92515.

Primary editor for this account, Andrew H. Price.